CIVIL ENGINEERING LABORATORY
SANITARY SEWER MAIN EXTENSION

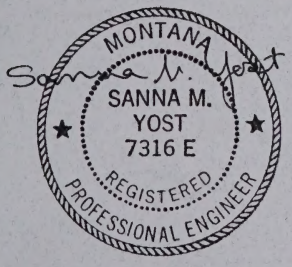
CARROLL COLLEGE
HELENA, MONTANA

Prepared for:

Carroll College
1601 N. Benton Avenue
Helena, MT 59625

Prepared by:

Morrison-Maierle, Inc.
910 Helena Avenue
P.O. Box 6147
Helena, MT 59604



Approved By: Sanna M. Yost
Sanna M. Yost, P.E.

RECEIVED
JUN 18 2003
MONTANA
DEPT. OF ENVIRONMENTAL QUALITY
COMMUNITY SERVICES BUREAU

June 17, 2003

MORRISON MAIERLE, INC.
An Employee-Owned Company

ENGINEERS
SCIENTISTS
SURVEYORS
PLANNERS

910 HELENA AVENUE • P.O. BOX 6147 • HELENA, MT 59604 • 406-442-3050 • FAX: 406-442-7862

June 17, 2003

RECEIVED
JUN 18 2003
MONTANA
DEPT. OF ENVIRONMENTAL QUALITY
COMMUNITY SERVICES BUREAU

Mr. Tim Stepp.
Montana Department of Environmental Quality
Solid Waste Program
P.O. Box 200901
Helena, Montana 59620

RE: Carroll College CE Lab Sanitary Sewer Main Extension
City of Helena Class II Landfill (Lic. #90) Crossing

Dear Mr. Stepp:

Enclosed for your review and approval, is a copy of the engineering design report with plans and specifications for the above-referenced project. In order to provide sanitary sewer service to the east side of the Carroll College campus, a new sanitary sewer main must be installed across Centennial Park to the existing City of Helena sewer mainline. This crossing will be similar in nature to the recently installed storm water main installed from Carroll College to the existing City of Helena storm mainline in Centennial Park.

The plans and specifications for this project incorporate all methane gas migration and monitoring components that were required in your letter of January 7, 2003 for the installation of the storm drain pipeline across the old landfill under Centennial Park. Upon the completion of this project, all public utilities for water, sewer and storm water will be in place to service the east side of the Carroll College campus and no need should exist to cross the old landfill in the future.

We will work closely with the City of Helena and their engineering representative for the methane mitigation issues, Ms. Jodi Bingham, to insure the landfill perforation and monitoring well are properly installed. As time is of the essence with this project, please call if you have any questions. Thank you for your assistance.

Sincerely,

MORRISON-MAIERLE, INC.

Sanna M. Yost

Sanna M. Yost, P.E.

CC: John Rundquist City of Helena
John Scharf Carroll College
Ryan Leland Montana DEQ
Jodi Bingham Hydrometrics

H:\WATER RESOURCES\0245\016-CE Lab\061703 DEQ-T Stepp.doc

TABLE OF CONTENTS

		Page
1.0	BACKGROUND	1
2.0	WASTEWATER FLOW PROJECTIONS	2
3.0	HYDRAULICS	3
4.0	RECOMMENDATIONS	5
5.0	LANDFILL CROSSING	6
6.0	PLANS AND SPECIFICATIONS	8
7.0	REFERENCES	8

LIST OF APPENDICES

APPENDIX A CHECKLISTS, REVIEW, CORRESPONDENCE

APPENDIX B FLOW PROJECTIONS AND HYDRAULICS CALCULATIONS

APPENDIX C PLANS AND SPECIFICATIONS

CIVIL ENGINEERING LABORATORY
SANITARY SEWER MAIN EXTENSION
CARROLL COLLEGE
HELENA, MONTANA

This report addresses technical design issues associated with providing sanitary sewer service to the newly constructed Civil Engineering Laboratory on the southeast corner of the Carroll College campus in Helena, Montana. The building permit has already been approved for this facility and facility construction is nearly complete. The permitted sanitary sewer service route was found to be unusable. This report has been prepared for permitting an alternative sanitary sewer service route. Time is critical.

1.0 BACKGROUND

DT Architects, of Helena Montana, designed and coordinated construction of the new Civil Engineering Laboratory (CE Lab) building. The building was originally designed and permitted to tie into an existing 6-inch sanitary sewer service line from Carroll's Water Barn building that is located approximately 100 feet south of the new CE Lab (east of the KTVH building and north of Lyndale Avenue). In approving the permit, the City's engineering staff requested that Carroll perform a TV inspection of the existing 6-inch service line to determine whether it was in good operating condition. Carroll did the inspection and discovered that the service line had collapsed in some locations. Subsequently, it was determined that replacing the existing sanitary sewer service was financially (and physically) prohibitive because of an extensive network of fiber optic cables along the proposed pipeline route between the KTVH Building and the KTVH Satellite Farm. In addition, the Water Barn is also presently without sanitary sewer service.

DT Architects contacted Morrison-Maierle, Inc., a Helena engineering firm, in early December 2002 to study alternative sanitary sewer routes for the new CE Lab building. The recommended alternative was to extend an 8-inch diameter City sanitary sewer

mainline from the sanitary sewer manhole east of the KTVH building, north along the west boundary of Centennial Park (east of the KTVH Satellite Farm) to the new CE Lab. An alternative route, for use if shallow bedrock existed in the recommended route, proposed to extend an 8-inch diameter City sanitary sewer main to the CE Lab from an existing City sanitary sewer manhole (#363-3) on the east side of Centennial Park. The alternative sanitary sewer route became the preferred route when shallow bedrock was subsequently encountered in the vicinity of the new CE Lab.

Morrison-Maierle Inc. was contracted by Carroll College on April 18, 2003 to assist in resolving the sanitary sewer issues associated with the new CE Lab and to develop an approvable design for providing sanitary sewer service to the new building and to the Water Barn. During an initial meeting with the City of Helena, the City staff was amenable to the College's proposal to extend a new mainline across Centennial Park to provide sanitary sewer service to two buildings in the southeast corner of the campus. Montana Department of Environmental Quality (DEQ) approval of the plans and specifications for the new mainline extension is required. DEQ approval is also required to excavate across the old City landfill under Centennial Park. An executed DEQ Sewer Main Checklist is in Appendix A of this report.

2.0 WASTEWATER FLOW PROJECTIONS

The CE Lab building has a classroom with occupancy for 25 students and two faculty offices. The building will serve an estimated 100 persons daily. There will be two single-stall bathrooms in the building. Typical wastewater flows for schools without cafeteria, gym or showers are 11 gallons per day (gpd) per person (MDEQ, 2000). This results in an average flow of 1,100 gpd or 0.8 gallons per minute (gpm) from the building. The peak discharge expected from the complex is 9 times greater than the average discharge or 7 gpm (Salvato, 1958). Using a fixture analysis, the peak discharge from the building will be 2 toilets at 15 gpm and 2 sink faucets at 5 gpm, or 40 gpm. Wastewater flow projection calculations are in Appendix B of this report.

A 2,000 gallon water tank will be located on the lower floor of the CE Lab building for use in conducting educational hydraulic experiments. Typically water for the educational experiments will circulate through a piping system and return to the storage tank. Occasionally, however, the tank will be drained to the sanitary sewer system and refilled. Draining the tank will flush the sanitary sewer system and result in short term full pipe flow in the new sanitary sewer line.

Carroll's drama department uses the Water Barn to construct sets and store costumes for drama productions. It has a single-stall bathroom with a utility sink. Peak flows generated from one toilet and one sink used simultaneously will be 20 gpm.

3.0 HYDRAULICS

An 8-inch diameter pipeline is the smallest diameter recommended for public sanitary sewer gravity mainlines (MDEQ, 1999). Hydraulic calculations are in Appendix B of this report.

The existing City sanitary sewer mainline along the east side of Centennial Park flows north in a 24-inch diameter reinforced concrete pipe as part of the City of Helena's sanitary sewer system. The mainline has a horizontal bend at a 60-inch diameter manhole (#363-3) directly east of the new CE Lab. A proposed 8-inch diameter sanitary sewer main extension for the CE Lab will extend east approximately 387 feet from existing manhole #363-3 in Centennial Park to the new manhole #03-24-1, located approximately 150 feet east of the CE Lab. An intermediate manhole, #03-24-2, will be installed on the extended sewer mainline at a grade break approximately 60 feet east of manhole #03-24-1 to minimize depth of bury of the new sanitary sewer main in the shallow bedrock area. The new 8-inch diameter PVC sanitary sewer main will meet the requirements of ASTM D 3034, SDR 35 and will be installed at a slope of 0.5%. The depth of flow in the extended mainline will be 0.125 feet during design flows of 40 gpm. At a slope of 0.5%, using a roughness coefficient (Manning's n) value of 0.010, the full flow capacity of the proposed pipe is 499 gpm. Full pipe flows will provide a velocity of 3.18 fps.

Because only minimum flows will be generated from both the new CE Lab and the Water Barn, 4-inch diameter service lines will be used to connect the buildings to the extended sewer main.

The CE Lab building sanitary sewer service line will be a 4-inch diameter PVC pipeline with 6.5 feet of cover. It will drain from the building connection (5 feet outside the building) to approximately 10 feet downstream of the new terminal manhole on the extended sewer mainline, on the west side of the CE Lab parking area (approximately 136 feet). The parking area will be graded to serve as a storm water detention basin for the southern portion of the campus and the adjacent neighborhood during extreme storm events (City of Helena Project No. 02-22). The maximum pond water surface elevation during a 100-year storm event will be 4004.5. Cleanout rims will be installed at elevation 4005.0 where possible. A minimum slope of 0.9% will be maintained across the parking lot to minimize depth of excavation into shallow bedrock between the new CE Lab and the terminal manhole of the extended sewer mainline (#03-24-01). Manhole #03-24-1 will be located in the earth berm on the east side of the parking area and the rim elevation will be 4005.0.

A new service line (approximately 187 feet) will also be installed from the Water Barn to the tie to the new sewer mainline approximately 5 feet downstream of new manhole #03-24-1 to replace the existing sanitary sewer service line that is crushed under the KTVH Satellite Farm. The new 4-inch diameter PVC sewer line will be installed from the Water Barn to manhole #03-24-1 at a slope of 0.9%.

Where the new 8-inch sanitary sewer main ties into existing manhole #363-3, an internal drop pipe will be used because the mainline will intercept the 60-inch diameter manhole about 10 feet above the invert. The internal drop pipe will be used to minimize excavation in the landfill adjacent to the manhole. The drop pipe will be installed adjacent to the west wall of the existing manhole and will be encased in concrete.

The new segment of sanitary sewer mainline will be primarily located on property owned by the City of Helena (Centennial Park). The western most 45 feet of the sewer mainline extension will be on Carroll College property, thus, a new utility 20 ft wide easement will be filed along this portion of the new sewer main. The City of Helena will take over the maintenance of the new sanitary sewer mainline upon completion of construction.

4.0 RECOMMENDATIONS

The recommended sanitary sewer mainline and sanitary sewer service lines are shown on the Exhibits 1 and 2 in Appendix C of this report.

Approximately 388 feet of 8-inch diameter PVC sanitary sewer main and two new 48-inch diameter precast concrete manholes will be installed as part of the extended sanitary sewer main. A new 48-inch diameter manhole (#03-24-2) will be installed approximately 328 feet west of the existing manhole (#363-3) at a grade break. Manhole #03-24-2 is on City of Helena park property. Manhole #03-24-1 is located approximately 60 feet west of manhole #03-24-2, in the earth berm on the east side of the parking area east of the new CE Lab.

Because of the depth (+21.0 feet) of the existing 60-inch diameter sanitary sewer manhole (#363-3) on the east side of Centennial Park and because the manhole is located in an old landfill cell, the extended sanitary sewer main will tap into the existing manhole via an internal pipe drop (in lieu of an external pipe drop). The drop pipe will be inside the existing manhole, adjacent to the west wall, and will be encased in concrete. Details are shown on Exhibit 2 in Appendix C.

A 4-inch sewer service line will replace the existing (crushed) 6-inch diameter sanitary sewer service line for the Water Barn. Approximately 10 feet south of the Water Barn, a sewer cleanout and bend will be installed on the existing service line. Four sanitary sewer clean outs (CO #CC03-3 to -6) will be installed at all horizontal and vertical bends and as needed to not exceed a cleanout spacing of 75 feet. The new sewer service line

will tie to the new sanitary sewer mainline approximately 5 feet downstream of the City's new 48-inch diameter precast concrete sanitary sewer manhole (#03-24-1) immediately east of the new CE Lab building.

The sanitary sewer service line for the new CE Lab building will consist of a 4-inch diameter PVC pipeline that exits the east side of the new building and flows approximately 136 feet to the connection to the new sewer mainline. The new sewer service line will tie to the new sanitary sewer mainline approximately 10 feet downstream of the City's new 48-inch diameter precast concrete sanitary sewer manhole (#03-24-1), the terminal of the new sewer main extension. Two sanitary sewer clean outs (CO #CC03-1 and -2) will be installed at all horizontal and vertical bends and as needed to not exceed a cleanout spacing of 75 feet.

The Water Barn service line will be abandoned downstream of cleanout CO #CC03-3. Downstream of the new cleanout (CO #CC03-3), the existing service line will be capped and the line will be abandoned in place per City of Helena regulations. Where the abandoned service line enters the existing, in-service manhole, it will be plugged with a watertight seal.

5.0 LANDFILL CROSSING

Because this project requires excavation into an old City of Helena Class II Landfill (License #90), safety precautions must be implemented because of exposure to, working in, and migration of methane gas from the landfill. The new sanitary sewer line will be located approximately 200 feet south of the Phase II Methane Extraction Trench installed and monitored by the City of Helena. The contractor and engineer will coordinate all construction work in the old landfill with the City of Helena and their engineering representative on the methane gas monitoring system.

A flowable fill plug will be utilized in lieu of pipe bedding were the new sanitary sewer main perforates the landfill cap. The purpose of the plug is to prevent the migration of methane gas off of City property onto Carroll College property through the pipe bedding

around the new sanitary sewer mainline. The net length of the flowable fill plug that blocks methane migration within the Type-I pipe bedding will be at least twice the horizontal length of the actual cover penetration and be centered on the midpoint. Details of the plug are shown on Exhibit 2 in Appendix C.

A methane gas monitoring well will be installed west of the plug in the pipe trench bedding approximately 10 feet east of the Carroll College property line on ground owned by the City of Helena. The purpose of the monitoring well is to ensure that no methane gas has seeped around the plug and is migrating off of City property onto Carroll College property through the pipe bedding around the new sanitary sewer mainline. The college will install a 1-inch diameter PVC pipe, perforated from the bottom of the pipe (4 inches below the flow line of the new sewer main) to 6 inches above the top of the new pipeline (depth of the Type-I pipe bedding). The PVC pipe will be encased in an 8-inch diameter steel casing pipe with a locking lid. A minimum of 12-inches of compacted fill must separate the bottom of the encasement pipe from the top of the type-I pipe bedding to ensure methane gas does not escape via the encasement pipe instead of being measured via the monitoring well. The City's engineering representative will install a PVC screw cap and sampling port on the 1-inch diameter PVC methane monitoring well to insure it matches the existing monitoring wells and is compatible with their monitoring equipment. Details of the monitoring well are shown on Exhibit 2 in Appendix C.

The existing landfill "cap" consists of approximately 3 feet of clean topsoil. This cap material will be salvaged, stockpiled separately from landfill wastes, replaced and compacted along the trenched area while excavating the installation trench through the old landfill. Trench backfill through the landfill will be compacted to 90% maximum dry density as required by MPW stand specifications for Type B backfill. Excess excavated waste material from the landfill will be hauled to and disposed of at an offsite landfill. If the local public landfill will not accept the material, it might be disposed up at a private landfill in the Helena Valley owned by City County Sanitation. Landfill mitigation measures will be included on the project's as-built plans. Construction photos taken in

the landfill areas will be also be provided as construction documentation. Disturbed areas along the surface of the trenched area and pipeline route will be graded smooth and re-vegetated and the ground surface will be left in preconstruction conditions. The contractor's trained and OSHA certified safety officer will monitor methane gas concentrations in the pipe trench during all construction activities in the Centennial Park area.

6.0 PLANS AND SPECIFICATIONS

The plan sheets for this project is included as Exhibits 1 and 2 in Appendix C of this report. The plan sheets shows known and existing utilities in the area. The contractor will be responsible for field verification of all buried utilities in the construction area. Details of the methane gas monitoring well and flowable fill plug are shown on the drawing.

Montana Public Works (MPW) specifications are being utilized for the construction of this project. Applicable MPW specifications are referenced on the plan sheets. Notes have been added, as needed, for further clarification.

7.0 REFERENCES

Haestad Methods. Flowmaster, Version 6.1. Hydraulic design software program. Waterbury CT.

Salvato, Joseph A. "The Design of Small Water Systems" an article from Salvato's book Environmental Sanitation. John Wiley & Sons, Inc. NY, NY. 1958.

Montana Department of Environmental Quality, 2000. Circular WQB 4: Montana Standards for On-Site Subsurface Sewage Treatment Systems. 2000 Edition.

Montana Department of Environmental Quality, 1999. Circular DEQ 2: Design Standards for Wastewater Facilities. 1999 Edition.

Morrison-Maierle, Inc. Carroll College Water System Master Plan. Helena, MT. July 2002

APPENDIX A

CHECKLISTS, REVIEW, CORRESPONDENCE

A.1 MONTANA DEQ SEWER MAIN CERTIFIED CHECKLIST

A.2 CITY LETTER REGARDING ADEQUATE CAPACITY

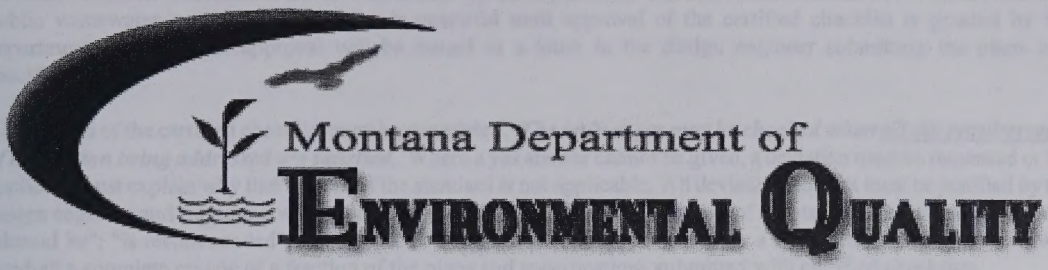
A.3 CITY REVIEW COMMENTS

A.4 RESPONSES TO CITY REVIEW COMMENTS

A.5 LETTER TO DEQ PLANNING DIVISION

A.6 LETTER TO DEQ SOLID WASTE PROGRAM

A.1 MONTANA DEQ SEWER MAIN CERTIFIED CHECKLIST



PERMITTING & COMPLIANCE DIVISION

♦ *Sewer Main* ♦

CERTIFIED CHECKLIST

May 12, 2003

CHECKLIST SUBMITTAL INSTRUCTIONS:

This checklist may be used in lieu of a complete department review when the conditions listed below are met. The department reviews all certified checklists for completeness and accuracy and must approve all deviation requests. Deviation requests will result in slower turn-around by the department. Checklist submittals can not be utilized for new public wastewater systems. Construction is unlawful until approval of the certified checklist is granted by the department. Department approval will be issued in a letter to the design engineer submitting the plans and specifications.

All sections of the certified checklist must be completed. ***The answer yes may be checked when all the requirements of the section being addressed are satisfied.*** Where a yes answer cannot be given, a deviation must be requested or the applicant must explain why that section of the standard is not applicable. All deviation requests must be justified by the design engineer and supported with appropriate documentation. Those sections of the standard that use the language "should be"; "is recommended"; or "is preferred" do not require a yes answer or a deviation. The department will conduct a complete review of a fraction of the plans and specifications submitted with certified checklists.

All sewer main certified checklists must be signed and stamped by the professional engineer responsible for the design of the project. In addition, the following information must be included with the submittal of the certified checklist:

1. Two sets of plans and specifications signed and stamped by a professional engineer.

2. An engineering report addressing the design capacity and flow requirements in sections 32 of Circular DEQ 2. The engineering report must include all applicable analysis and supporting assumptions.

3. A map showing the location of the proposed sewer main in relation to the rest of the distribution system.

4. ***For sewer main extensions:*** An **approval letter from a professional engineer** who is empowered by the owner of a public system providing service to the proposed sewer main and who represents the interests of the public system with regard to **system capacity and other pertinent issues to the system**. For those systems not represented by a professional engineer (city engineer) on staff (or retained), the above mentioned approval letter is not required if the proposed sewer main is part of a utility master plan previously approved by the department. A copy of the applicable portion of this master plan must be included in the certified checklist submittal.

   For sewer main replacements: The main replacement pipe diameter must be equal to, or greater than, the existing pipe diameter and an approval letter from the owner of the system providing service must be submitted with the checklist. A professional engineer on staff or a master plan is not required.

   Systems not able to satisfy the above criteria are not eligible to use the certified checklist and are subject to a complete departmental review of the plans and specifications.

5. Certification that a professional engineer will be retained for construction inspection and will certify completion in accordance with the approved plans and prepare as-builts for submittal to the department within 90 days of project completion.

The fee for processing each certified checklist is $25.00 and must be included with the submittal. The E.Q. number, fee and date items will be filled in by the department. Completed checklist submittals may be mailed to: Department of Environmental Quality, Permitting & Compliance Division, Community Services Bureau, Metcalf Building, P.O. Box 200901, Helena, MT 59620-0901; or for those systems served by the Billings Office: Department of Environmental Quality, Community Services Bureau, Airport Business Park 1P-9, 1371 Rimtop Drive, Billings, MT 59105-1978. Questions can be answered by writing the above address or calling (406) 444-4400 in Helena and (406) 247-4445 in Billings.

DEPARTMENT OF ENVIRONMENTAL QUALITY
SEWER MAIN CERTIFIED CHECKLIST

Project Name Carroll College Civil Engineering Lab Sanitary Sewer Main Extension

Location Carroll College, Helena, Montana County Lewis & Clark

Public Supply Owner City of Helena, Montana

Address 316 North Park, Helena, MT 59623

Engineer Morrison-Maierle, Inc., Sanna M. Yost, P.E.

Address 910 Helena Avenue, Helena, Montana 59604

Department use only

Fee Submitted E.Q. Number

Date Received

DESIGN STANDARDS

The plans and specifications for the above referenced project are in compliance with the following sections of the Department of Environmental Quality Circular DEQ 2, 1999 Edition.

SECTION 31. Yes ☒ Deviation Requested

N/A ☐ Explain *Proposed sewer line is designed for municipal wastewater only.*

SECTION 32. Yes ☒ Deviation Requested

N/A ☐ Explain *The new sewer line will be an 8-inch PVC pipe. Actual flow within the proposed line will require much less capacity than an 8-inch diameter pipe.*

SECTION 33.1 Yes ☒ Deviation Requested

N/A ☐ Explain *The new sanitary sewer main will be an 8-inch diameter pipe.*

SECTION 33.2 Yes ☒ Deviation Requested

N/A ☐ Explain *The proposed sewer line is to be located a minimum of 6-feet below the grounds surface, and below the frost line to prevent freezing.*

SECTION 33.3 Yes ☒ Deviation Requested

N/A ☐ Explain *High groundwater conditions do not exist in the project area.*

SECTION 33.41 Yes ☒ Deviation Requested

N/A ☐ Explain *The slope of the proposed sewer main will be 0.5%, which is steeper than the minimum of 0.4%.*

SECTION 33.42 Yes ☐ Deviation Requested

N/A ☒ Explain *Slopes less than 0.4% are not anticipated with this project.*

SECTION 33.43 Yes ☐ Deviation Requested

N/A ☒ Explain *Oversized sewers are not being proposed.*

SECTION 33.44 Yes ☒ Deviation Requested _____

N/A ☐ Explain *Sewers will be laid at uniform slopes between manholes.*

SECTION 33.45 Yes ☒ Deviation Requested _____

N/A ☐ Explain *Where velocities exceed 15 fps, provisions are made to protect against displacement.*

SECTION 33.46 a. Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewers will not be constructed at slopes 20% or greater.*

SECTION 33.46 b. Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewers will not be constructed at slopes 20% or greater.*

SECTION 33.46 c. Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewers will not be constructed at slopes 20% or greater.*

SECTION 33.5 Yes ☒ Deviation Requested _____

N/A ☐ Explain *Sewers will be laid with a straight alignment between manholes.*

SECTION 33.6 Yes ☐ Deviation Requested _____

N/A ☒ Explain *The joining sewer lines are of the same diameter, 8-inch.*

SECTION 33.7 Yes ☒ Deviation Requested _____

N/A ☐ Explain *The proposed sewer main materials will be PVC meeting ASTM D-3034.*

SECTION 33.81 Yes ☒ Deviation Requested _____

N/A ☐ Explain *Sewers will be installed in accordance with the current Montana Public Works (MPW) Standard Specifications.*

SECTION 33.82 a. Yes ☒ Deviation Requested _____

N/A ☐ Explain *Sewers will be installed in accordance with the current MPW Standard Specifications.*

SECTION 33.82 b. Yes ☒ Deviation Requested _____

N/A ☐ Explain *Sewers will be installed in accordance with the current MPW Standard Specifications.*

SECTION 33.83 a. Yes ☒ Deviation Requested _____

N/A ☐ Explain *Sewers will be installed in accordance with the current MPW Standard Specifications.*

SECTION 33.83 b. Yes ☒ Deviation Requested _____

N/A ☐ Explain *Sewers will be installed in accordance with the current MPW Standard Specifications.*

SECTION 33.83 c. Yes ☒ Deviation Requested _____

N/A ☐ Explain *Sewers will be installed in accordance with the current MPW Standard Specifications.*

SECTION 33.84 a. Yes ☒ Deviation Requested _____

N/A ☐ Explain *Sewers will be installed in accordance with the current MPW Standard Specifications.*

SECTION 33.84 b. Yes ☒ Deviation Requested _____

N/A ☐ Explain *Sewers will be installed in accordance with the current MPW Standard Specifications.*

SECTION 33.85 a. Yes ☒ Deviation Requested _____

N/A ☐ Explain *The new sewer line will be tested in accordance with the MPW Standard Specification.*

SECTION 33.85 b. Yes ☒ Deviation Requested _____

N/A ☐ Explain *The new sewer line will be tested in accordance with the MPW Standard Specification.*

SECTION 33.85 c. Yes ☒ Deviation Requested _____

N/A ☐ Explain *The new sewer line will be tested in accordance with the MPW Standard Specification.*

SECTION 33.85 d. Yes ☒ Deviation Requested _____

N/A ☐ Explain *The new sewer line will be tested in accordance with the MPW Standard Specification.*

SECTION 33.91 Yes ☒ Deviation Requested _____

N/A ☐ Explain *Sewers will be installed in accordance with the current MPW Standard Specifications.*

SECTION 33.92 Yes ☒ Deviation Requested _____

N/A ☐ Explain *The new sewer line will be tested in accordance with the MPW Standard Specification.*

SECTION 33.93 Yes ☒ Deviation Requested _____

N/A ☐ Explain *The new sewer line will be tested in accordance with the MPW Standard Specification.*

SECTION 33.94 Yes ☒ Deviation Requested _____

N/A ☐ Explain *The new sewer line will be tested in accordance with the MPW Standard Specification.*

SECTION 33.95 Yes ☒ Deviation Requested _____

N/A ☐ Explain *Service connections will be watertight. A manhole will be added on the extended mainline at the intersection of a major 8-inch diameter service line from St. Charles and St. Albert's Halls.*

SECTION 34.1 Yes ☐ Deviation Requested _____

N/A ☒ Explain *Two new manholes will be installed with this project: one at the upper end and the second at the intersection with a major 8-inch diameter sewer service line. The existing manhole at the downstream end of the extension will be modified to accommodate the new incoming sewer, in accordance with the MPW Standard Specifications. A drop pipe will be used at the existing manhole.*

SECTION 34.2 Yes ☒ Deviation Requested _____

N/A ☐ Explain *A drop pipe will be installed in the existing manhole in accordance with the MPW Standard Specifications. A drop pipe will also be installed on a new manhole at the intersection with a major service line.*

SECTION 34.3 Yes ☐ Deviation Requested _____

N/A ☒ Explain *Two new 48-inch diameter precast concrete manholes are to be constructed with this project.*

SECTION 34.4 Yes ☒ Deviation Requested _____

N/A ☐ Explain *Flow channels will be incorporated into the new manholes per MPW Standard Specifications.*

SECTION 34.5 Yes ☒ Deviation Requested _____

N/A ☐ Explain *Benches will be provided within manholes per MPW Standard Specifications.*

SECTION 34.6 Yes ☒ Deviation Requested _____

N/A ☐ Explain *48-inch diameter precast concrete manholes will be provided in accordance with MPW Standard Specifications as will modifications to the existing manhole.*

SECTION 34.7 Yes ☒ Deviation Requested _____

N/A ☐ Explain *Manholes will be tested in accordance with the MPW Standard Specification.*

SECTION 34.8 Yes ☒ Deviation Requested _____

N/A ☐ Explain *Corrosion is not anticipated.*

SECTION 34.9 Yes ☐ Deviation Requested _____

N/A ☒ Explain *No electrical equipment is to be installed within the manholes.*

SECTION 35. Yes ☐ Deviation Requested _____

N/A ☒ Explain *There are no inverted siphons in this project.*

SECTION 36.1 Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewers are not being constructed near, adjacent to, over or under streams or any water body.*

SECTION 36.11 a. Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewers are not being constructed near, adjacent to, over or under streams or any water body.*

SECTION 36.11 b. Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewers are not being constructed near, adjacent to, over or under streams or any water body.*

SECTION 36.11 c. Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewers are not being constructed near, adjacent to, over or under streams or any water body.*

SECTION 36.12 Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewers are not being constructed near, adjacent to, over or under streams or any water body.*

SECTION 36.13 Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewers are not being constructed near, adjacent to, over or under streams or any water body.*

SECTION 36.14 Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewers are not being constructed near, adjacent to, over or under streams or any water body.*

SECTION 36.21 Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewers are not being constructed near, adjacent to, over or under streams or any water body.*

SECTION 36.22 Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewers are not being constructed near, adjacent to, over or under streams or any water body.*

SECTION 37. Yes ☐ Deviation Requested _____

N/A ☒ Explain *There are no aerial crossings as a part of this project.*

SECTION 38.1 Yes ☒ Deviation Requested _____

N/A ☐ Explain *There are no physical connections between potable water supply systems and the proposed sewer.*

SECTION 38.2 Yes ☒ Deviation Requested _____

N/A ☐ Explain *Sewer mains will not be constructed within 100 feet of a public water supply well.*

SECTION 38.31 a. Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewer mains will be laid at least 10 feet horizontally from any existing or proposed water main.*

SECTION 38.31 b. Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewer mains will be laid at least 10 feet horizontally from any existing or proposed water main.*

SECTION 38.31 c. Yes ☐ Deviation Requested _____

N/A ☒ Explain *Sewer mains will be laid at least 10 feet horizontally from any existing or proposed water main.*

SECTION 38.32 a. Yes ☐ Deviation Requested _____

N/A ☒ Explain *There is greater than 18-inches between the proposed sewer and water main crossing.*

SECTION 38.32 b. Yes ☐ Deviation Requested _____

N/A ☒ Explain *There is greater than 18-inches between the proposed sewer and water main crossing.*

SECTION 38.32 c. Yes ☐ Deviation Requested _____

N/A ☒ Explain *There is greater than 18-inches between the proposed sewer and water main crossing.*

SECTION 38.32 d. Yes ☐ Deviation Requested _____

N/A ☒ Explain *There is greater than 18-inches between the proposed sewer and water main crossing.*

SECTION 38.32 e. Yes ☐ Deviation Requested _____

N/A ☒ Explain *There is greater than 18-inches between the proposed sewer and water main crossing.*

SECTION 38.32 f. Yes ☐ Deviation Requested _____

N/A ☒ Explain *There is greater than 18-inches between the proposed sewer and water main crossing.*

SECTION 39.1 Yes ☒ Deviation Requested _____

N/A ☐ Explain *Sewer services will be constructed in accordance with the current MPW Standard Specifications.*

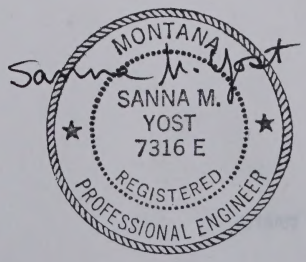
CERTIFYING STATEMENT

I certify that I have examined the above checklist and supporting documentation and attachments and find this information to be correct, true and complete. I find the plans and specifications for the above reference project to be in compliance with the Department of Environmental Quality Circular DEQ 2.

_____ May 15, 2003

(Signature of Professional Engineer) (Date Signed)

Sanna M. Yost, P.E.
Montana P.E. Number 7316E



PE Stamp

A.2 CITY LETTER REGARDING ADEQUATE CAPACITY

City of Helena
316 N. Park Avenue
Helena, Montana 59623

RECEIVED
JUN 12 2003
MORRISON-MAIERLE, INC.

June 9, 2003

Morrison Maierle
ATTN: SANNA YOST, P.E.
P.O. Box 6147
Helena, Montana 59601

RE: CARROLL COLLEGE CIVIL ENGINEERING/SCIENCE LAB, PROJECT NO. 03-24

Dear Sanna:

The purpose of this letter is to certify that the City of Helena has adequate capacity in our wastewater collection and treatment systems to serve this project.

Please let me know if you need additional assistance.

Sincerely,

JOHN RUNDQUIST, P.E.
PUBLIC WORKS DIRECTOR

c: Kevin Hart, Utilities Superintendent

A.3 CITY REVIEW COMMENTS

RECEIVED
JUN 1 2 2003
MORRISON-MAIERLE, INC.

City of Helena

Infrastructure Plan Submittal Review

Project Name: Carroll College Sewer main extension
Engineer: Morrison – Maierle, Inc., Sanna M. Yost, P.E.
City Project Number: 03-24
Date Received: 5/19/03
Current Date: 6/3/03

The City of Helena Engineering Division has reviewed your submittal and has noted the following deficiencies, problems or comments on your drawings, specifications and/or your design reports:

Wastewater:

- Both sewer services need to be tied on to 8-inch main.
- For long services cleanouts are required every 75-feet.
- The sewer end in manhole # 363-3 cannot be capped. Access to the main is needed for maintenance.

The current status of your submittal is "Revise and Resubmit". The plans, specifications and reports should be revised as noted and resubmitted. We recommend that the engineer provide a design memorandum, as part of the re-submittal that specifically addresses the required changes or concerns.

Due to the preliminary nature of the project plans and specifications, this review may not include all future comments or concerns. The city reserves the right to add or revise comments and requirements.

If you have any questions please call me at 447-8426.

Sincerely,

John Rundquist, P.E.
Public Woks Director

CC: Michael Barros, Community Development Director
Bill Michalson, Street Division Superintendent
Kevin Hart, Utility Maintenance Division Superintendent
Brandt Salo, Chief Building Official

A.4 RESPONSES TO CITY REVIEW COMMENTS

MORRISON MAIERLE, INC.
An Employee-Owned Company

memorandum

TO: **John Rundquist, Public Works Director**
City Of Helena

FROM: **Sanna Yost, P.E.**
Morrison-Maierle, Inc.

RE: **Responses to City Review Comments on the Carroll College CE Lab Sanitary Sewer Main Extension Submittal**

DATE: **June 17, 2003**

The following are the responses to the City of Helena review comments on the New Residence Hall Infrastructure Submittal received by Morrison-Maierle on June 12, 2003.

WASTEWATER:

- **Comment:** Both sewer services need to be tied on to the 8-inch main.
  Response: *This change has been incorporated into the plans.*

- **Comment:** For long services cleanouts are required every 75-feet.
  Response: *This change has been incorporated into the plans.*

- **Comment:** The sewer end in manhole #363-3 cannot be capped. Access to the main is needed for maintenance.
  Response: *This change has been incorporated into the plans. The removable (screwed) end cap has been removed from the plan detail.*

The three comments noted in your review comments have been incorporated into the final plans. Six sets of final project plans that have been signed and stamped by the engineer are attached for your approval stamp.

We understand that one set of approved plans must be onsite at all times and that any significant deviations from the approved plans during construction must be approved by the design engineer and the City of Helena in advance of the work.

CC: John Scharf — Carroll College
Ryan Leland — Montana Dept. of Environmental Quality

MORRISON MAIERLE, INC.

memorandum

TO: Jane Ringelud, Public Works Director
City Of Helena

FROM: Sonia Yost, P.E.
Morrison-Maierle, Inc.

RE: Responses to City Review Comments on the
Carroll College CE Lab Sanitary Sewer Main Extension Submittal

DATE: June 17, 2003

The following are the responses to the City of Helena review comments on the New Residence Hall Preliminary Submittal received by Morrison-Maierle on June 12, 2003.

WASTEWATER:

- Comment: Both sewer services need to be tied on to the 8-inch main.
  Response: The change has been incorporated into the plans.

- Comment: For long services cleanouts are required every 75 feet.
  Response: The change has been incorporated into the plans.

- Comment: The sewer end in manhole #2013.3 cannot be capped. Access to the main is needed for maintenance.
  Response: The change has been incorporated into the plans. The removable cap has been removed from the plan details.

The three comments noted in your review comments have been incorporated into the final plans. Six sets of final project plans that have been signed and stamped by the engineer are attached for your approval stamp.

We understand that one set of approved plans must be onsite at all times and that any significant deviations from the approved plans during construction must be approved by the design engineer and the City of Helena in advance of the work.

CC: John Schutt, Carroll College
Ryan Lutes, Montana Dept. of Environmental Quality

A.5 LETTER TO DEQ PLANNING DIVISION

MORRISON MAIERLE, INC.
An Employee-Owned Company

ENGINEERS
SCIENTISTS
SURVEYORS
PLANNERS

910 HELENA AVENUE • P.O. BOX 6147 • HELENA, MT 59604 • 406-442-3050 • FAX: 406-442-7862

June 17, 2003

Mr. Ryan Leland, P.E.
Montana Department of Environmental Quality
Planning Division
P.O. Box 200901
Helena, Montana 59620

RE: Checklist Project Review: Carroll College CE Lab Sanitary Sewer Main Extension

Dear Mr. Leland:

Your expedient review of this checklist submittal will be greatly appreciated, as the new CE Lab is already constructed. Sanitary sewer service must be installed before students return in August. Attached are the following for your review and approval:

1. Two copies of the design report for the sanitary sewer system improvements.
2. Two copies of the Project Plan sheets with referenced Montana Public Works specifications. (In Appendix C of the design report).
3. An executed copy of the *Montana Department of Environmental Quality Sewer Main Certified Checklist.* (In Appendix A.1 of the design report).
4. A copy of a letter from the City of Helena stating that the City's sanitary sewer system has capacity for this extension. (In Appendix A.2 of the design report).
5. A copy of the City's review comments on the original plans and of our responses to those comments. (In Appendices A.3 and A.4 of the design report).
6. A check in the amount of $25, which we understand is the standard fee for a *Checklist* project.

The City of Helena had 3 minor comments on the plans, which have been incorporated into the final plans transmitted with this submittal. The final approval letter from the City of Helena's Public Works Director is forthcoming. Upon your approval, the final documents will be prepared and presented to the contractor for construction. If you have any questions, please call.

Sincerely,

MORRISON-MAIERLE, INC.

Sanna M. Yost

Sanna M. Yost, P.E.

CC: John Rundquist City of Helena
John Scharf Carroll College
Tim Stepp Montana DEQ

H:\WATER RESOURCES\0245\016-CE Lab\061703 DEQ-sewer.doc

MORRISON MAIERLE, INC.

June 11, 2003

Mr. Ryan Leland, P.E.
Montana Department of Environmental Quality
Planning Division
P.O. Box 200901
Helena, Montana 59620

RE: Checklist Project Review, Carroll College CE Lab Sanitary Sewer Main Extension

Dear Mr. Leland:

Your engineering review of the above subject submittal will be greatly appreciated as the new CE Lab is already constructed. Sanitary sewer service must be installed before students return in August. Attached are the following for your review and approval:

1. Two copies of the design report for the sanitary sewer system improvements.
2. Two copies of the Project Plan sheets with the stamp of Montana Public Works specifications (in Appendix D of the design report).
3. An overlayed copy of the Montana Department of Environmental Quality Sewer System Design Engineer (in Appendix A-3 of the design report).
4. A copy of a letter from the City of Helena stating that the City's sanitary sewer system has capacity for the connection. (In Appendix A-2 of the design report).
5. A copy of the City's review comments on the original plans and our responses to those comments. (In Appendices A-3 and A-4 of the design report).
6. A check in the amount of $35 which we understand is the standard fee for a Checklist project.

The City of Helena had 3 minor comments on the plans which have been incorporated into the final plans dated with this submittal. The final approval letter from the City of Helena's Public Works Director is forthcoming. Upon your approval, the final documents will be prepared and presented to the contractor for construction. If you have any questions, please call.

Sincerely,

MORRISON-MAIERLE, INC.

Sanna M. Vast, P.E.

cc: John Rondeau, City of Helena
John Sorrell, Carroll College
Tim Stepp, Montana DEQ

A.6 LETTER TO DEQ SOLID WASTE PROGRAM

MORRISON MAIERLE, INC.
An Employee-Owned Company

ENGINEERS
SCIENTISTS
SURVEYORS
PLANNERS
910 HELENA AVENUE • P.O. BOX 6147 • HELENA, MT 59604 • 406-442-3050 • FAX: 406-442-7862

June 17, 2003

Mr. Tim Stepp.
Montana Department of Environmental Quality
Solid Waste Program
P.O. Box 200901
Helena, Montana 59620

RE: Carroll College CE Lab Sanitary Sewer Main Extension
City of Helena Class II Landfill (Lic. #90) Crossing

Dear Mr. Stepp:

Enclosed for your review and approval, is a copy of the engineering design report with plans and specifications for the above-referenced project. In order to provide sanitary sewer service to the east side of the Carroll College campus, a new sanitary sewer main must be installed across Centennial Park to the existing City of Helena sewer mainline. This crossing will be similar in nature to the recently installed storm water main installed from Carroll College to the existing City of Helena storm mainline in Centennial Park.

The plans and specifications for this project incorporate all methane gas migration and monitoring components that were required in your letter of January 7, 2003 for the installation of the storm drain pipeline across the old landfill under Centennial Park. Upon the completion of this project, all public utilities for water, sewer and storm water will be in place to service the east side of the Carroll College campus and no need should exist to cross the old landfill in the future.

We will work closely with the City of Helena and their engineering representative for the methane mitigation issues, Ms. Jodi Bingham, to insure the landfill perforation and monitoring well are properly installed. As time is of the essence with this project, please call if you have any questions. Thank you for your assistance.

Sincerely,

MORRISON-MAIERLE, INC.

Sanna M. Yost

Sanna M. Yost, P.E.

CC: John Rundquist City of Helena
John Scharf Carroll College
Ryan Leland Montana DEQ
Jodi Bingham Hydrometrics

H:\WATER RESOURCES\0245\016-CE Lab\061703 DEQ-T Stepp.doc

APPENDIX B

FLOW PROJECTIONS AND HYDRAULICS CALCULATIONS

Full Flow Capacity in 8" mainline @ s=0.5%
Worksheet for Circular Channel

Project Description	
Worksheet	sewer service
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data		
Mannings Coefficient	0.010	
Slope	0.005000	ft/ft
Diameter	8	in

Results		
Depth	8.0	in
Discharge	499	gal/min
Flow Area	0.3	ft²
Wetted Perimeter	2.09	ft
Top Width	0.00	ft
Critical Depth	0.50	ft
Percent Full	100.0	%
Critical Slope	0.006014	ft/ft
Velocity	3.18	ft/s
Velocity Head	0.16	ft
Specific Energy	9.9	in
Froude Number	0.00	
Maximum Discharg	536	gal/min
Discharge Full	499	gal/min
Slope Full	0.005000	ft/ft
Flow Type	N/A	

Normal Flow in 8" mainline @ s=0.5%
Worksheet for Circular Channel

Project Description	
Worksheet	sewer service
Flow Element	Circular Channel
Method	Manning's Formul
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.010	
Slope	0.005000	ft/ft
Diameter	8	in
Discharge	40	gal/min

Results		
Depth	1.5	in
Flow Area	4.7e-2	ft²
Wetted Perimeter	0.60	ft
Top Width	0.52	ft
Critical Depth	0.14	ft
Percent Full	19.2	%
Critical Slope	0.003914	ft/ft
Velocity	1.91	ft/s
Velocity Head	0.06	ft
Specific Energy	2.2	in
Froude Number	1.13	
Maximum Discharg	536	gal/min
Discharge Full	499	gal/min
Slope Full	0.000032	ft/ft
Flow Type	Supercritical	

Normal Flow in 4" service line @ s=0.9%
Worksheet for Circular Channel

Project Description	
Worksheet	sewer service
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.010	
Slope	0.009000	ft/ft
Diameter	4	in
Discharge	40	gal/min

Results		
Depth	1.7	in
Flow Area	3.6e-2	ft²
Wetted Perimeter	0.47	ft
Top Width	0.33	ft
Critical Depth	0.17	ft
Percent Full	42.7	%
Critical Slope	0.005250	ft/ft
Velocity	2.51	ft/s
Velocity Head	0.10	ft
Specific Energy	2.9	in
Froude Number	1.34	
Maximum Discharg	113	gal/min
Discharge Full	105	gal/min
Slope Full	0.001298	ft/ft
Flow Type	Supercritical	

© Haestad Methods, Inc.
Morrison-Maierle Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

WASTEWATER FLOW PROJECTIONS

METHOD 1 – POPULATION METHOD

	Classroom Occupancy	Classes Per Day	Population	Daily use rate (1)(2) gpcd	Average Use		Peak Use Factor	
					gpcd	gpm	gpcd	gpm
Buildings	25	4	100	15	1,500	4.00	(3) 6.67	10.00
Faculty			2	15	30	0.02	2.0	0.04
TOTAL					1,530	4.04	(3) 7.0	9.88

(1) Criteria (ED) 4, 2000 Edition. Students 11 gpcd, Faculty 15 gpd
(2) Design and Construction of Small Water Systems, AWWA, 1984. Students and Faculty 15 gpd

METHOD 2 – FIXTURE METHOD

CE LABORATORY	Number of Fixtures	Unit Flow (3) gpm	Peak Use gpm
Toilets	2	10	20
Sinks	2	5	10
TOTAL			30

Because it's extremely unlikely that all 3 toilets and 3 sinks will operate simultaneously, design flows will be based on all fixtures in CE Lab. only operating simultaneously. Water Saver fixtures will be installed.

WATER BARN	Number of Fixtures	Unit Flow (3) gpm	Peak Use gpm
Toilets	3	10	30
Sinks	2	5	10
TOTAL			40

Use Fixture Method for design values

MAIN BUILDING	Number of Fixtures	Unit Flow (3) gpm	Peak Use gpm
Toilets	3	10	30
Sinks	2	5	10
TOTAL			40

(3) Design and Construction of Small Water Systems, AWWA, 1984

WASTEWATER FLOW PROJECTIONS

METHOD 1 -- POPULATION METHOD

	Classroom Occupancy	Classes Per Day	Population	Daily use rate (1)(2)	Average Use		Peak Use Factor	
				gpd	gpd	gpm	gpd	gpm
							9.0	
Students	25	4	100	15	1,500	1.04	13,500	9.38
Faculty	--	--	2	15	30	0.02	270	0.19
TOTAL					1,530	**1.06**	13,770	**9.56**

(1) Circular DEQ 4, 2000 Edition: Students 11 gpd; Faculty 13 gpd
(2) Design and Construction of Small Water Systems, AWWA, 1984: Students and Faculty 15 gpd

METHOD 2 -- FIXTURE METHOD

CE LABORATORY	Number of Fixtures	Unit Flow (2) gpm	Peak Use gpm
Toilets	2	15	30
Sinks	2	5	10
TOTAL			**40**

Because it's extremely unlikely that all 3 toilets and 3 sinks will operate simultaneously, design flows will be based on all fixtures in CE Lab, only, operating simultaneously. Water Barn flows will be incidental.

WATER BARN	Number of Fixtures	Unit Flow (2) gpm	Peak Use gpm
Toilets	1	15	15
Sinks	1	5	5
TOTAL			**20**

Use Fixture Method for design values

BOTH BUILDINGS	Number of Fixtures	Unit Flow (2) gpm	Peak Use gpm
Toilets	3	15	45
Sinks	3	5	15
TOTAL			**60**

(2) Design and Construction of Small Water Systems, AWWA, 1984

CIRCULAR DEQ 4

MONTANA STANDARDS

FOR ON-SITE SUBSURFACE SEWAGE

TREATMENT SYSTEMS

2000 Edition

TABLE 5-1
TYPICAL WASTEWATER FLOWS FROM COMMERCIAL SOURCES

Source	Unit	Wastewater Flow, gpd/unit Range	Typical
Airport	Passenger	2-4	3
Automobile Service Station	Vehicle Served	7-13	10
	Employee	9-15	12
Bar	Customer	5	3
	Employee	10-16	13
Department Store	Toilet Room	400-600	500
	Employee	8-12	10
Hotel/Motel	Guest	40-56	48
	Employee	7-13	10
Industrial Building (Sanitary waste only)	Employee	10-16	13
Laundry	Machine	450-650	580
(Self-serve)	Wash	45-55	50
Office	Employee	7-16	13
Restaurant	Meal	2-4	3
Shopping Center	Parking Space	1-2	2
	Employee	7-13	10

TABLE 5-2
TYPICAL WASTEWATER FLOWS FROM INDUSTRIAL SOURCES

Source	Unit	Wastewater Flow, gpd/unit Range	Typical
Church	Seat		3
(Not including a kitchen, food service facility, day care, or camp)			
Church	Seat		5
(Including kitchen, but not including a food service facility, day care, or camp)			
Hospital, medical	Bed	125-240	165
	Employee	5-15	10
Hospital, mental	Bed	75-140	100
	Employee	5-15	10
Prison	Inmate	75-150	115
	Employee	5-15	10
Rest home	Resident	50-120	85
School, day:			
With cafeteria, gym, showers	Student	15-30	25
With cafeteria only	Student	10-20	15
Without cafeteria, gym, showers	Student	5-17	11
School, boarding	Student	50-100	75

TABLE 5-3
TYPICAL WASTEWATER FLOWS FROM RECREATIONAL FACILITIES

Source	Unit	Wastewater Flow, gpd/unit Range	Typical
Apartment, resort	Person	50-70	60
Cabin, resort	Person	8-50	40
Cafeteria	Customer	1-3	2
	Employee	8-12	10
Campground (developed)	Person	20-40	30
Cocktail lounge	Seat	12-25	20
Coffee shop	Customer	4-8	6
	Employee	8-12	10
Country club	Member present	60-130	100
	Employee	10-15	13
Day camp (no meals)	Person	10-15	13
Dining hall	Meal served	4-10	7
Dormitory, bunkhouse	Person	20-50	40
Hotel/Motel, resort	Person	40-60	50
Store, resort	Customer	1-4	3
	Employee	8-12	10
Swimming pool	Customer	5-12	10
	Employee	8-12	10
Theater	Seat	2-4	3
Visitor center	Visitor	4-8	5
Travel trailer parks without individual Hookups for water or sewer	Space		50
Travel trailer parks with individual Hookups for water and/or sewer	Space		100

5.5 Waste segregation

5.5.1 General

Waste segregation systems consist of dry disposal for human waste, such as various chemical and incinerator type systems with separate disposal for gray water. However, regardless of the type of dry disposal system used, the gray water must be disposed of using an approved on-site sewage treatment system, with no flow or size reduction allowed for the waste segregation.

5.5.2 Location

A complete layout showing the location of the drainfield and 100 percent replacement site must be provided.

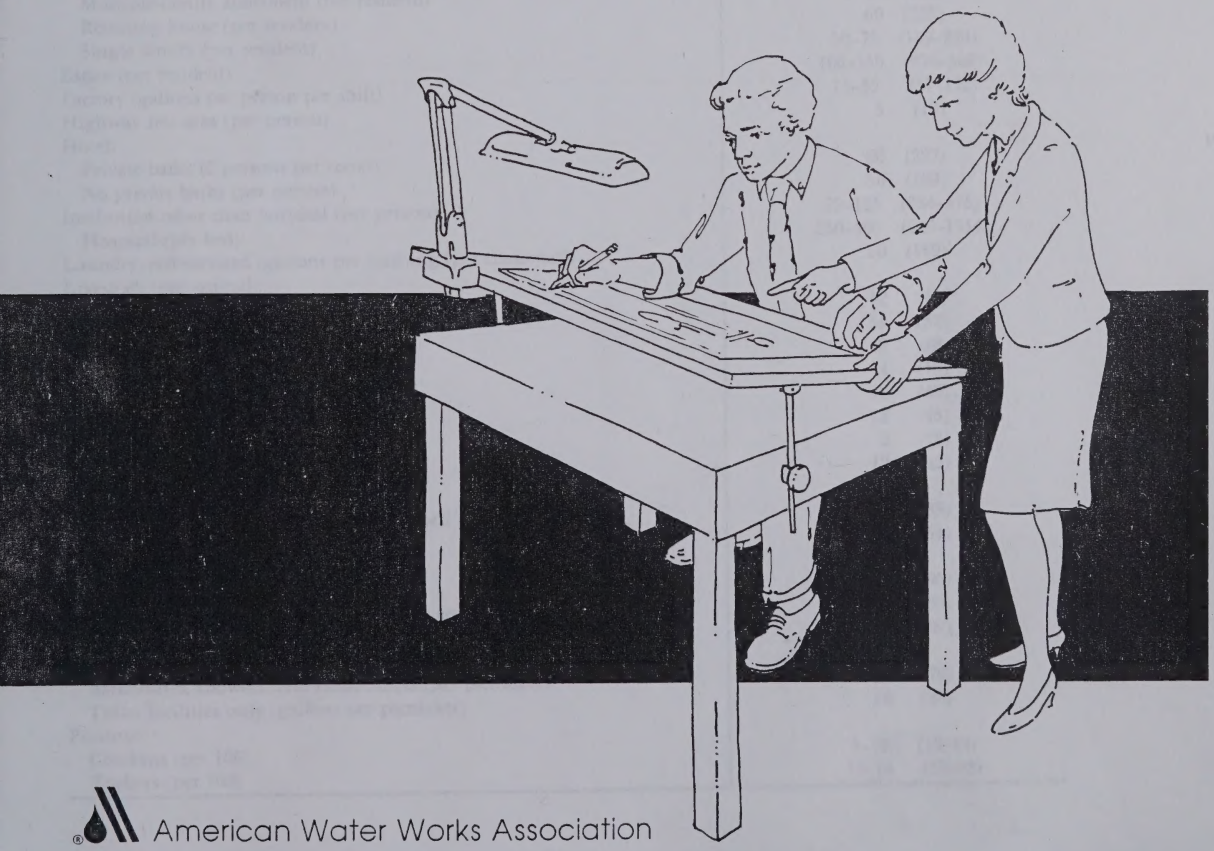
5.5.3 Maintenance

Final sludge disposal must be in compliance with federal regulations, 40 CFR Part 503.

VOST

Design and Construction of Small Water Systems—A Guide for Managers

An AWWA Small-Systems Resource Book



American Water Works Association

Design and Construction of Small Water Systems—A Guide for Managers

An AWWA Small Systems Resource Book

American Water Works Association

Table 1-3
Planning Guide for Water Use

Type of Establishment	Water Used *gpd (L/day)*
Airport (per passenger)	3-5 (11-19)
Apartment, multiple family (per resident)	60 (227)
Bathhouse (per bather)	10 (38)
Camp:	
Construction, semipermanent (per worker)	50 (189)
Day, no meals served (per camper)	15 (57)
Luxury (per camper)	100-150 (379-568)
Resort, day and night, limited plumbing (per camper)	50 (189)
Tourist, central bath and toilet facilities (per person)	35 (132)
Cottage, seasonal occupancy (per resident)	50 (189)
Court, tourist, individual bath units (per person)	50 (189)
Club:	
Country (per resident member)	100 (379)
Country (per nonresident member present)	25 (95)
Dwelling:	
Boardinghouse (per boarder)	50 (189)
Additional kitchen requirements for nonresident boarders	10 (38)
Luxury (per person)	100-150 (379-568)
Multiple-family apartment (per resident)	40 (151)
Rooming house (per resident)	60 (227)
Single family (per resident)	50-75 (189-284)
Estate (per resident)	100-150 (379-568)
Factory (gallons per person per shift)	15-35 (57-132)
Highway rest area (per person)	5 (19)
Hotel:	
Private baths (2 persons per room)	60 (227)
No private baths (per person)	50 (189)
Institution other than hospital (per person)	75-125 (284-473)
Hospital (per bed)	250-400 (946-1514)
Laundry, self-serviced (gallons per washing [per customer])	50 (189)
Livestock (per animal):	
Cattle (drinking)	12 (45)
Dairy (drinking and servicing)	35 (132)
Goat (drinking)	2 (8)
Hog (drinking)	4 (15)
Horse (drinking)	12 (45)
Mule (drinking)	12 (45)
Sheep (drinking)	2 (8)
Steer (drinking)	12 (45)
Motel:	
Bath, toilet, and kitchen facilities (per bed space)	50 (189)
Bed and toilet (per bed space)	40 (151)
Park:	
Overnight, flush toilets (per camper)	25 (95)
Trailer, individual bath units, no sewer connection (per trailer)	25 (95)
Trailer, individual baths, connected to sewer (per person)	50 (189)
Picnic:	
Bathhouses, showers, and flush toilets (per picnicker)	20 (76)
Toilet facilities only (gallons per picnicker)	10 (38)
Poultry:	
Chickens (per 100)	5-10 (19-38)
Turkeys (per 100)	10-18 (38-68)

Table 1-3 *(continued)*
Planning Guide for Water Use

Type of Establishment	Water Used *gpd (L/day)*
Restaurant:	
Toilet facilities (per patron)	7-10 (26-38)
No toilet facilities (per patron)	2½-3 (9-11)
Bar and cocktail lounge (additional quantity per patron)	2 (8)
School:	
Boarding (per pupil)	75-100 (284-379)
Day, cafeteria, gymnasiums, and showers (per pupil)	25 (95)
Day, cafeteria, no gymnasiums or showers (per pupil)	20 (76)
Day, no cafeteria, gymnasiums, or showers (per pupil)	15 (57)
Service station (per vehicle)	10 (38)
Store (per toilet room)	400 (1514)
Swimming pool (per swimmer)	10 (38)
Theater:	
Drive-in (per car space)	5 (19)
Movie (per auditorium seat)	5 (19)
Worker:	
Construction (per person per shift)	50 (189)
Day (school or offices per person per shift)	15 (57)

Table 1-4
Rates of Flow for Certain Plumbing, Household, and Farm Fixtures

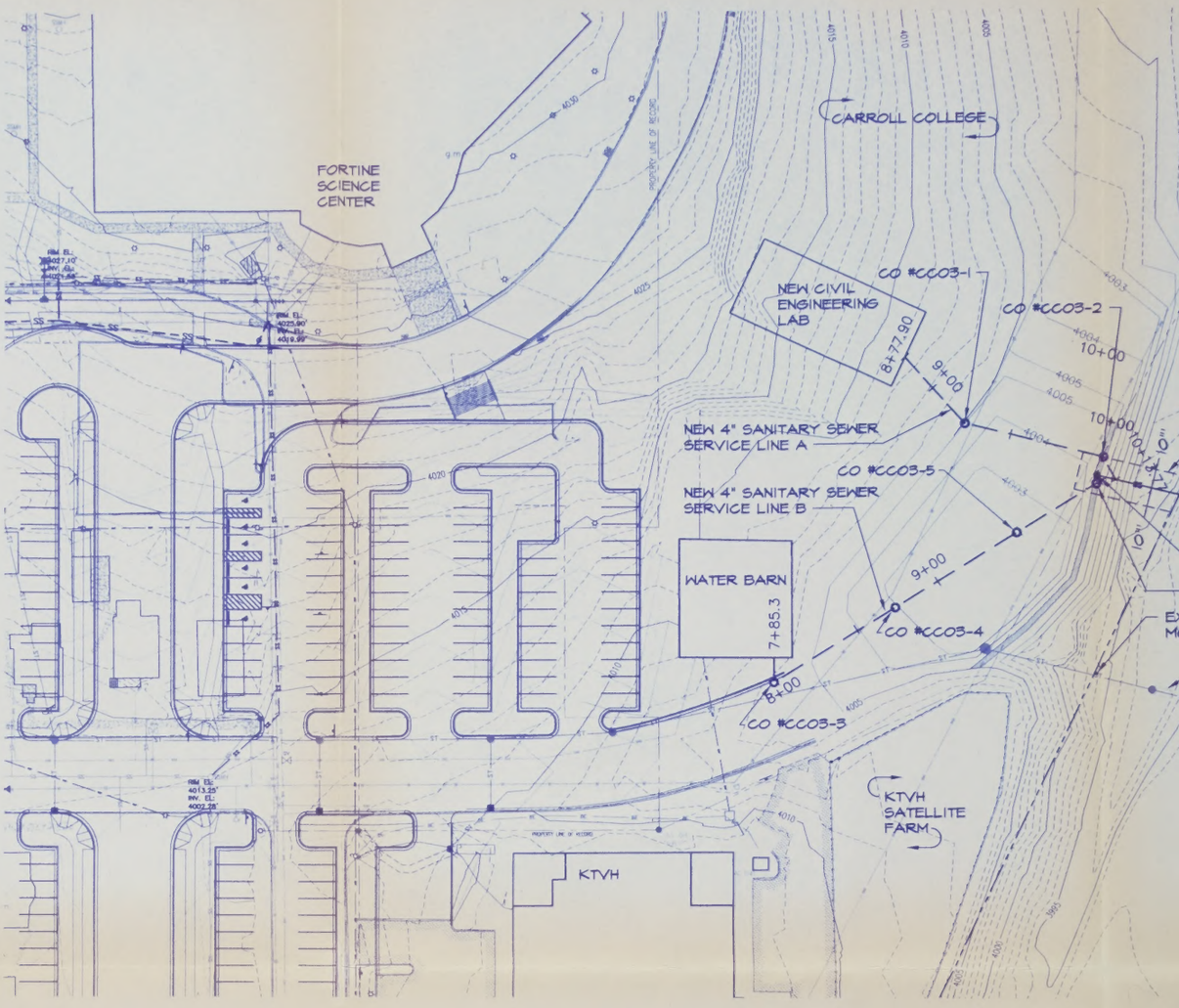
Location	Flow Pressure* *psi (kPa)*	Flow Rate *gpm (L/min)*
Ordinary basin faucet	8 (55)	2.0 (7.5)
Self-closing basin faucet	8 (55)	2.5 (9.5)
Sink faucet, ⅜ in. (10 mm)	8 (55)	4.5 (17.0)
Sink faucet, ½ in. (13 mm)	8 (55)	4.5 (17.0)
Bathtub faucet	8 (55)	6.0 (23.0)
Laundry tub faucet, ½ in. (13 mm)	8 (55)	5.0 (19.0)
Shower	8 (55)	5.0 (19.0)
Ball-cock for closet	8 (55)	3.0 (11.0)
Flush valve for closet	15 (103)	15.0-40.0 (57.0-151.0)†
Flushometer valve for urinal	15 (103)	15.0 (57.0)
Garden hose, 50 ft (15 m) (¾-in. [13-mm] sill cock)	30 (207)	5.0 (19.0)
Garden hose, 50 ft (15 m) (⅝-in. [16-mm] outlet)	15 (103)	3.33 (13.0)
Drinking fountain	15 (103)	0.75 (3.0)
Fire hose, 1½ in. (6 mm) (½-in. [13-mm] nozzle)	30 (207)	40.0 (151.0)

*Flow pressure is the pressure in the supply near the faucet or water outlet while the faucet or water outlet is wide open and flowing. Flow pressure is measured in pounds per square inch (kilopascals).

†Wide range due to variation in design and type of closet flush valves.

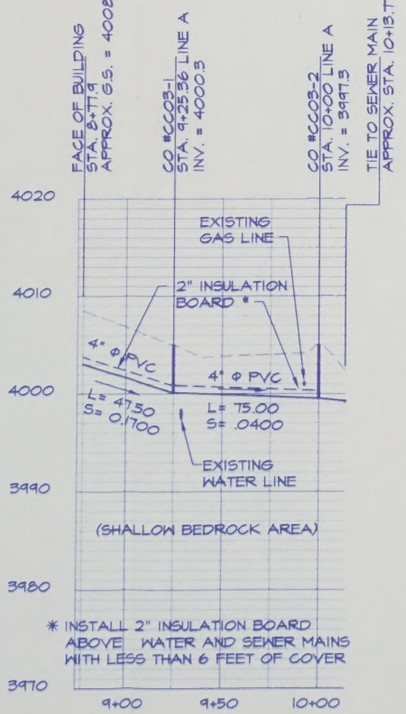
APPENDIX C

PLANS AND SPECIFICATIONS

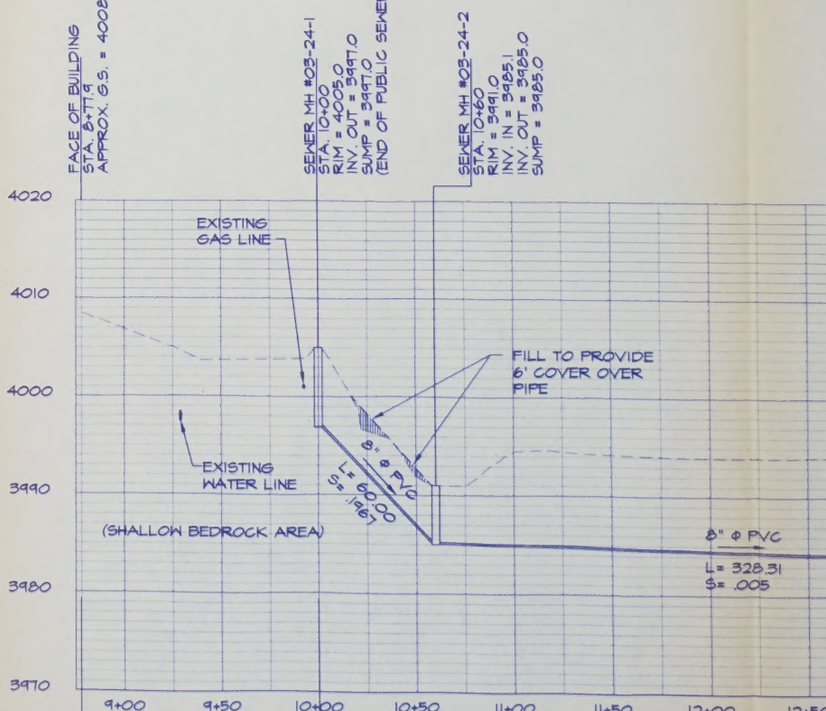


SEWER PLAN

LOCATIONS OF ALL BURIED UTILITIES TO BE FIELD

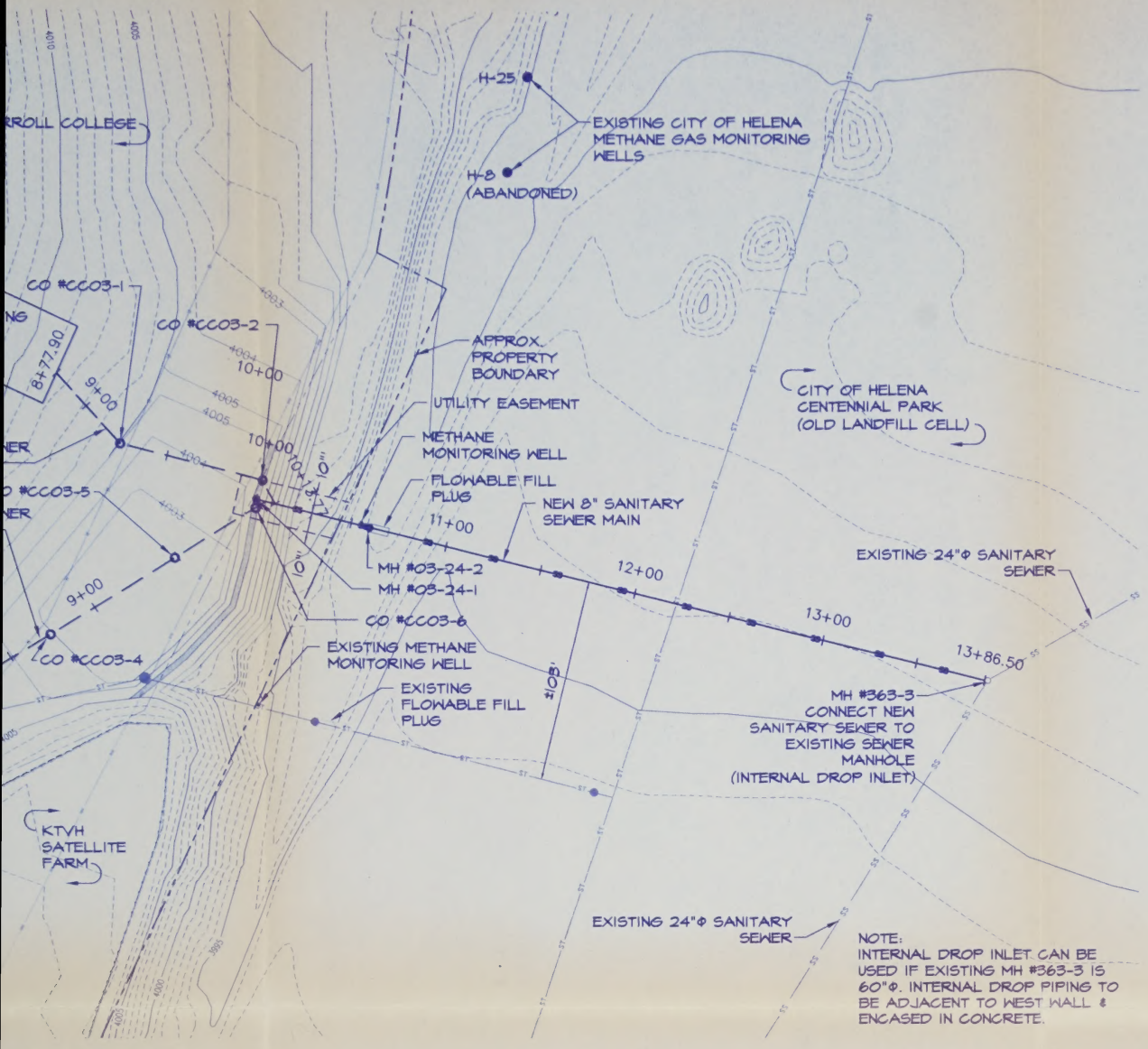


SERVICE LINE A



MAIN EXTENSION PROFILE

H:\HIGHWAYS\3574_Carroll College\ACAD\soils lab newsewer.dwg Jun/17/2003



SEWER PLAN

URIED UTILITIES TO BE FIELD VERIFIED

LEGEND

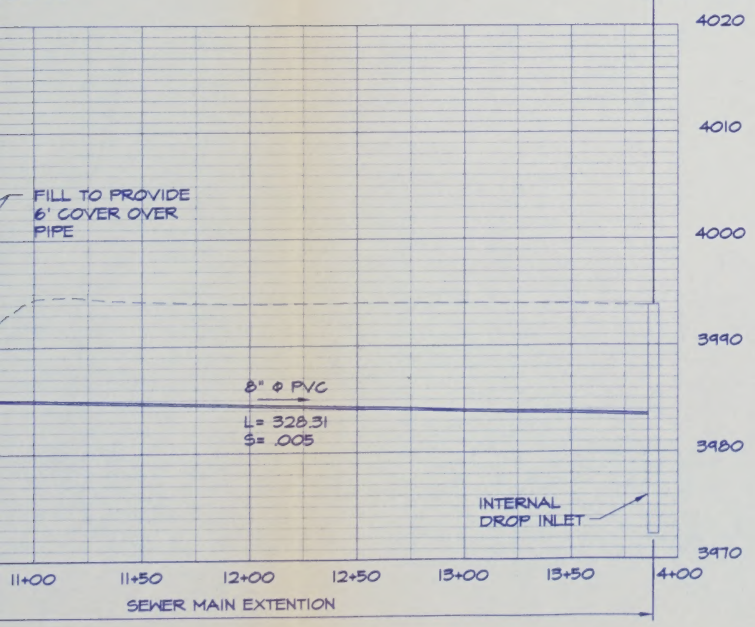
- PROPOSED CLEANOUT (CO)
- PROPOSED MANHOLE (MH)
- PROPOSED SANITARY SEWER MAIN
- PROPOSED SEWER SERVICE LINE
- EXISTING STORM DRAIN
- EXISTING WATER MAIN
- EXISTING BURIED ELECTRIC
- EXISTING GAS LINE
- EXISTING SEWER LINE
- EXISTING COMMUNICATION LINE
- PROPERTY BOUNDARY

RECEIVED
JUN 18 2003
MONTANA
DEPT. OF ENVIRONMENTAL QUALITY
COMMUNITY SERVICES BUREAU

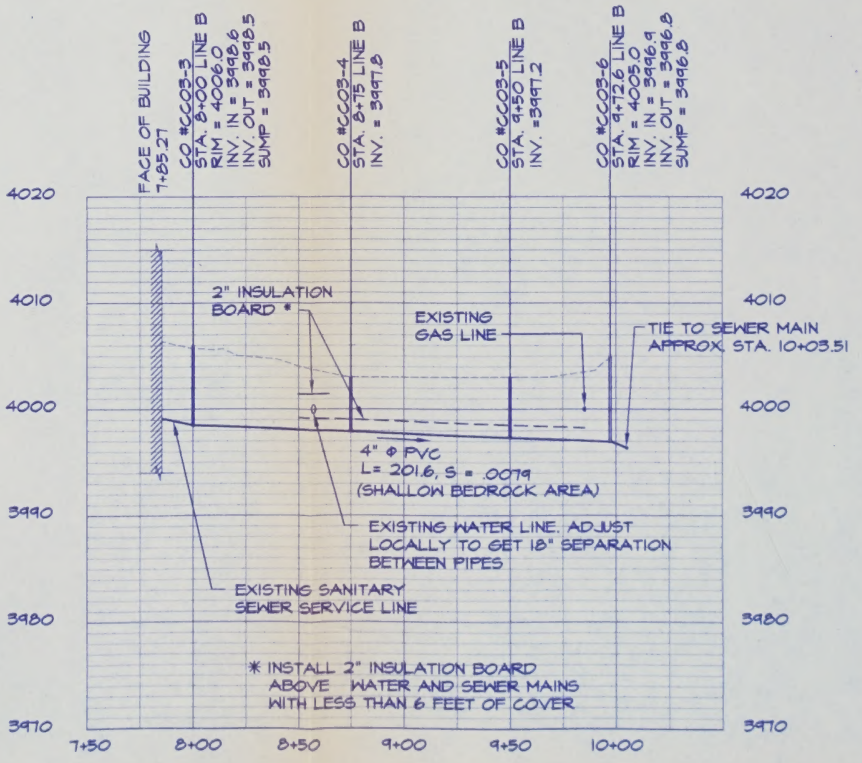
N

50 0 50 100
SCALE IN FEET

MONTANA
SANNA M. YOST
7316 E
REGISTERED PROFESSIONAL ENGINEER



XTENSION PROFILE



SERVICE LINE B PROFILE

CITY OF HELENA PROJECT No. 03-24

VERIFY SCALE!
THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.
MODIFY SCALE ACCORDINGLY!

REVISIONS			
NO.	DESCRIPTION	DATE	BY

MORRISON MAIERLE, INC.
An Employee-Owned Company
910 Helena Avenue Helena MT 59604
Phone: (406) 442-3050 Fax: (406) 442-7862
COPYRIGHT © MORRISON MAIERLE, INC., 2002

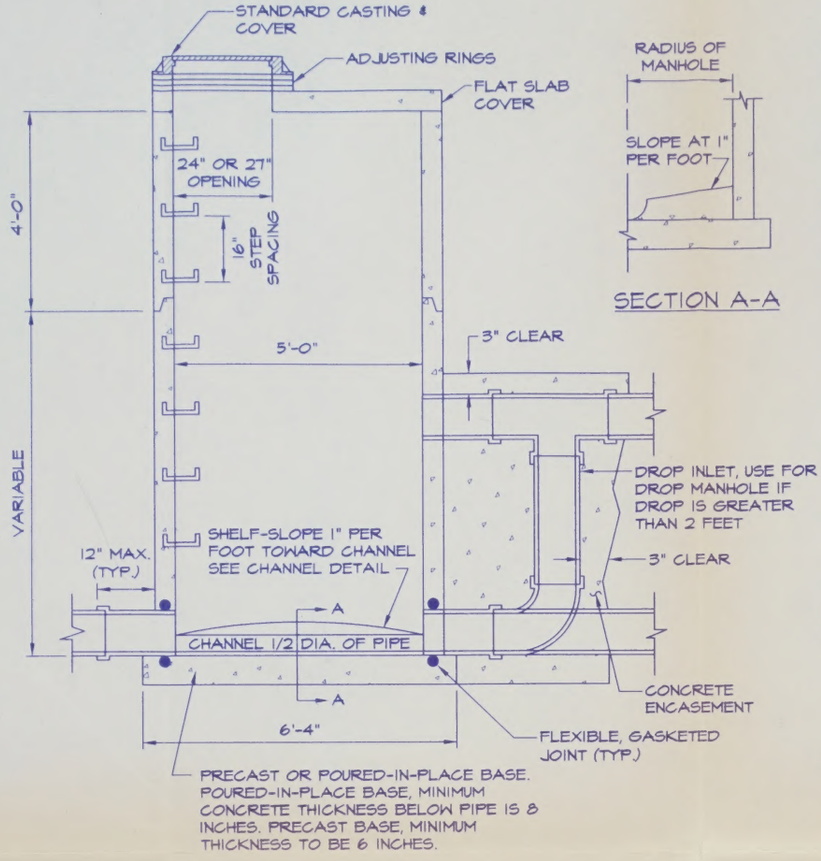
CARROLL COLLEGE CIVIL ENGINEERING LAB
SEWER MAIN EXTENSION PROJECT
HELENA MONTANA

SANITARY SEWER PLAN AND PROFILE

DRAWN BY: JQG
CHK'D. BY: SMY
APPR. BY: SMY
DATE: 6/2003
Q.A. REVIEW
BY:
DATE:

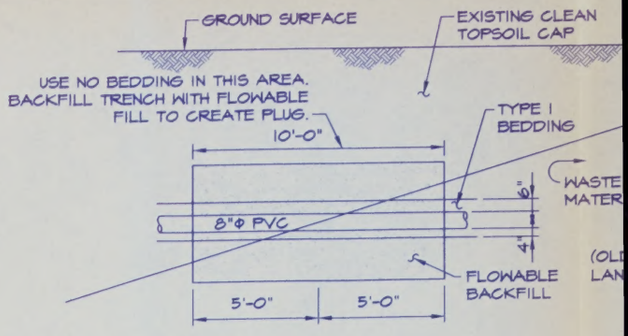
PROJECT NO. 0245-016
SHEET NUMBER 1
DRAWING NUMBER EXHIBIT 1

NOTE:
ALL JOINTS BETWEEN MANHOLE SECTIONS, ADJUSTING RINGS, MANHOLE RING & TOP SECTION, AND ROUND SEWER PIPE INTO MANHOLE SHALL BE WATERTIGHT. JOINING MATERIAL SHALL BE "RAM-NEK" OR APPROVED EQUAL FOR ALL JOINTS EXCEPT BETWEEN SEWER PIPE AND MANHOLE WALL.



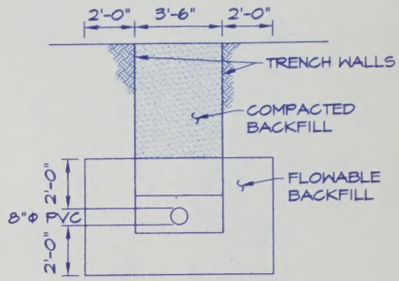
SECTION A-A

SANITARY SEWER AND STORM DRAIN MANHOLE DETAIL
N.T.S.



AT CAP PERFORATION:
ENVELOPE PIPE WITH FLOWABLE FILL. 2FT. ABOVE AND BELOW PIPE AND 2FT. INTO UNDISTURBED SOILS ON EAST SIDE OF TRENCH.

SECTION VIEW



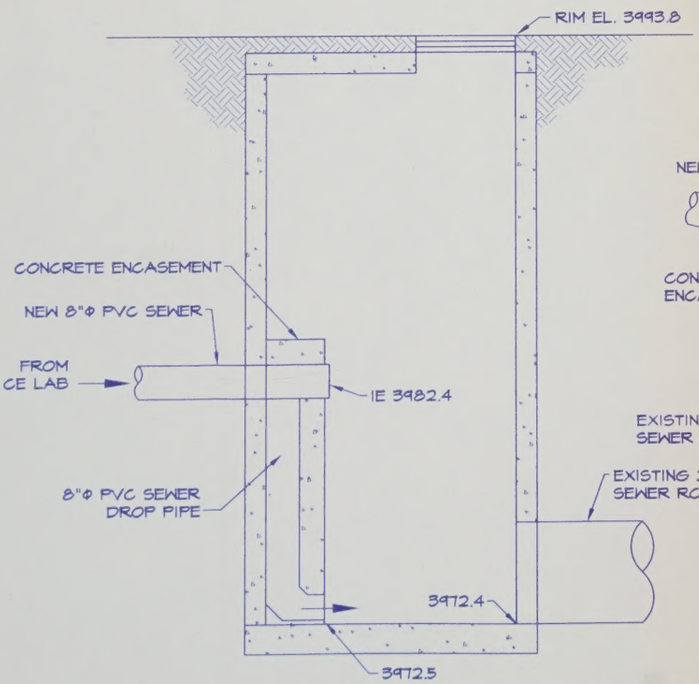
PROFILE VIEW

PURPOSE:
TO PREVENT MIGRATION OF METHANE GAS FROM LANDFILL.

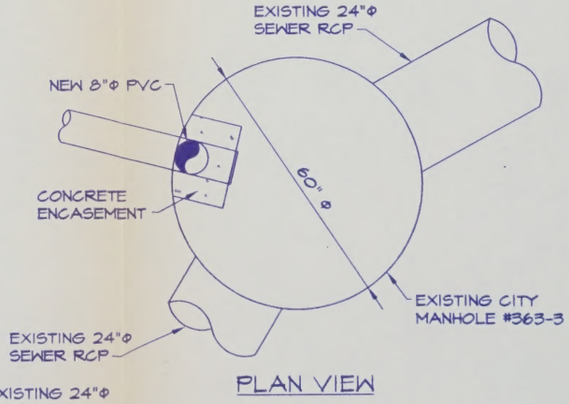
LOCATION:
WEST EDGE OF OLD LANDFILL IN CENTENNIAL PARK.

NOTE:
FLOWABLE FILL TO BE FURNISHED AND INSTALLED IN ACCORDAN
MPW SECTION 02225 FLOWABLE FILL.

FLOWABLE FILL PLUG DETAIL
N.T.S.



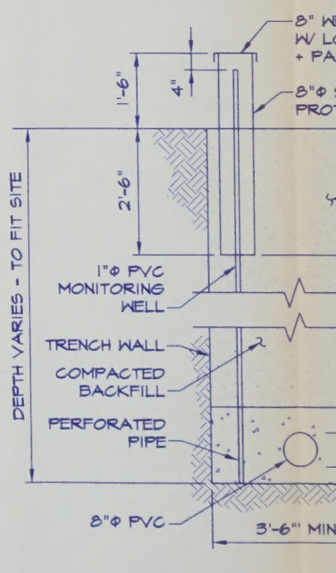
SECTION VIEW



PLAN VIEW

RECEIVED
JUN 18 2003
MONTANA
DEPT. OF ENVIRONMENTAL QUALITY
COMMUNITY SERVICES BUREAU

MH #363-3 INTERNAL DROP INLET DETAIL
N.T.S.



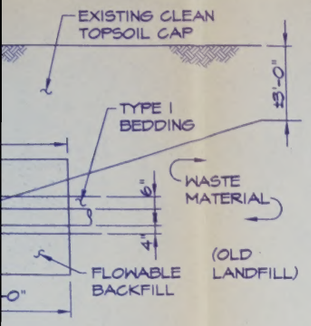
* BY BIG SKY METAL WORKS OR CRANE

NOTE:
MONITORING WELL IS PERFORATED
BEDDING. WELL EXTENDS FROM TR
ABOVE GROUND SURFACE. UPPER
ENCASEMENT PIPE, BUT ADJUST LE
INSURE 12" MINIMUM SEPARATION F

METHANE GAS MONI
N.T.S.

(ON CITY PROPERTY, APPROX.. TO 10' E
PROPERTY BOUND

H:\HIGHWAYS\3574_Carroll College\ACAD\soils lab newsewer.dwg Jun/17/2003



FT. ABOVE AND BELOW
S ON EAST SIDE OF TRENCH.

N

2"

TRENCH WALLS

COMPACTED
BACKFILL

FLOWABLE
BACKFILL

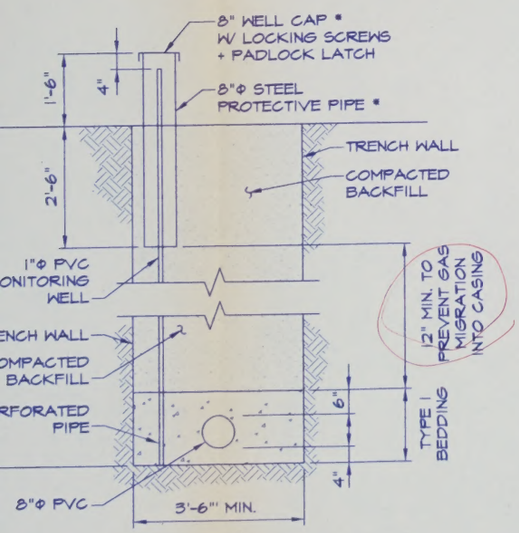
EW

NE GAS FROM LANDFILL.

ENTENNIAL PARK.

AND INSTALLED IN ACCORDANCE WITH
LL.

L PLUG DETAIL



SKY METAL WORKS OR CRANE ENTERPRISES HELENA, MT

E:
ITORING WELL IS PERFORATED ONLY WITHIN THE PIPE
DING. WELL EXTENDS FROM TRENCH BOTTOM TO ± 18"
VE GROUND SURFACE. UPPER 4FT. WITHIN 8"Φ STEEL
ASEMENT PIPE, BUT ADJUST LENGTH AS REQUIRED TO
RE 12" MINIMUM SEPARATION FROM PIPE BEDDING.

HANE GAS MONITORING WELL

PROPERTY, APPROX.. TO 10' EAST OF CARROLL COLLEGE
PROPERTY BOUNDARY)

SURVEY MONUMENTS & PROPERTY CORNERS
REFERENCE ALL SURVEY MONUMENTS, SECTION CORNERS, 1/4 CORNERS AND PROPERTY CORNERS PRIOR TO BEING DISTURBED BY CONSTRUCTION. REPLACE ANY MONUMENTS AND CORNERS THAT ARE DISTURBED DURING CONSTRUCTION.

TELEPHONE, NATURAL GAS AND ELECTRICAL POWER
CONTACT THE UTILITIES UNDERGROUND LOCATION CENTER AT LEAST TWO DAYS BEFORE BEGINNING EXCAVATION OR OTHER CONSTRUCTION OPERATIONS. (1-800-424-5555)

MONTANA PUBLIC WORKS (MPW) STANDARD SPECIFICATIONS
ALL ITEMS OF WORK UNDER THIS CONTRACT WILL BE COMPLETED IN ACCORDANCE WITH THE FOLLOWING SECTIONS OF THE MPW STANDARD SPECIFICATIONS:

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01580 - CONSTRUCTION TRAFFIC CONTROL

DIVISION 2 - SITEWORK

SECTION 02112 - REMOVAL OF EXISTING PAVEMENT, CONCRETE CURB, SIDEWALK, DRIVEWAY AND/OR STRUCTURES
SECTION 02221 - TRENCH EXCAVATION AND BACKFILL FOR PIPELINES AND APPURTENANT STRUCTURES
SECTION 02250 - WATERING
SECTION 02528 - CONCRETE CURB AND GUTTER
SECTION 02529 - CONCRETE SIDEWALKS, DRIVEWAYS, APPROACHES, AND MISCELLANEOUS NEW CONCRETE CONSTRUCTION
SECTION 02610B - SANITARY SEWER MAIN MATERIALS
SECTION 02722 - SANITARY SEWER MAIN
SECTION 02724 - SANITARY SEWER AND STORM DRAIN SERVICES
SECTION 02910 - SEEDING

DIVISION 3 - CONCRETE (FOR WATER/SEWER STRUCTURE ONLY)

SECTION 03210 - REINFORCING STEEL
SECTION 03300 - CAST-IN-PLACE CONCRETE

SANITARY SEWER NOTES:

1. CONSTRUCT NEW SANITARY SEWER IN ACCORDANCE WITH MPW STANDARD DRAWING NUMBER 02722-1 THRU 8 AND WITH MPW STANDARD DRAWING NUMBER 02221-1, 02221-2, 02713-2.

2. FURNISH MANHOLE COVERS WITH THE WORD "SEWER".

3. THE COMPLETE SEWER MAIN WILL BE TV INSPECTED PER CITY OF HELENA REQUIREMENTS.

4. ABANDON EXISTING SEWER SERVICES THAT WILL NO LONGER BE IN USE, PER CITY OF HELENA CODE.

5. RE-SEED ALL AREAS DISTURBED BY CONSTRUCTION VEGETATION THAT ARE OUTSIDE OF THE AREAS DESIGNATED FOR ASPHALT PAVEMENT.

6. TYPE A TRENCH BACKFILL WILL BE USED ON AREAS PROPOSED FOR PAVEMENT. TYPE B TRENCH BACKFILL WILL BE USED ONLY IN LANDSCAPED AREAS NOT DESIGNATED FOR FUTURE PAVING AND IN CENTENNIAL PARK.

7. TYPE I PIPE BEDDING INCLUDES THE MATERIAL PLACED 4 INCHES BELOW THE BOTTOM OF THE PIPE TO 6 INCHES ABOVE THE PIPE.

8. ALL EXPLORATORY EXCAVATION REQUIRED FOR THE LOCATION OF EXISTING UNDERGROUND UTILITIES SHALL BE INCLUDED AS PART OF THE CONTRACT PRICE. NO EXTRA COMPENSATION WILL BE MADE FOR THIS WORK.

9. TRENCH DIMENSIONS - MAXIMUM TRENCH WIDTH SHALL BE 7 FEET. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COMPLY WITH CURRENT OSHA REGULATIONS. SUBSURFACE CONDITIONS SHOULD BE OBSERVED DURING EXCAVATION IN ORDER TO MAKE ADJUSTMENTS TO CONSTRUCTION PROCEDURES THAT WILL ENSURE WORKER SAFETY.

10. CONTRACTOR TO FIELD VERIFY DEPTH OF ALL PERTINENT EXISTING UTILITIES.

11. CONSTRUCT WATERTIGHT CONNECTIONS AND MANHOLE CUTOUTS WITH NON-SHRINK GROUT.

12. REFER TO MONTANA PUBLIC WORKS STANDARD SPECIFICATIONS, STANDARD DRAWING No. 02713-2 FOR PIPE CROSSINGS SEPARATION.

METHANE GAS MONITORING SYSTEM NOTES

1. THIS PROJECT REQUIRES EXCAVATION INTO AN OLD CITY OF HELENA CLASS II LANDFILL (LICENSE #90), WHICH IS BENEATH CENTENNIAL PARK.

2. SAFETY PRECAUTIONS MUST BE IMPLEMENTED BECAUSE OF EXPOSURE TO, WORKING IN, AND MIGRATION OF METHANE GAS FROM THE LANDFILL.

3. THE NEW SANITARY SEWER MAIN WILL BE LOCATED APPROXIMATELY 200 FEET SOUTH OF THE PHASE II METHANE EXTRACTION TRENCH ON THE WEST SIDE OF CENTENNIAL PARK WHICH WAS INSTALLED AND IS MONITORED BY THE CITY OF HELENA.

4. THE CONTRACTOR AND ENGINEER WILL COORDINATE ALL CONSTRUCTION WORK IN THE OLD LANDFILL WITH THE CITY OF HELENA AND THEIR ENGINEERING REPRESENTATIVE ON THE METHANE GAS MONITORING SYSTEM.

5. A FLOWABLE FILL PLUG WILL BE UTILIZED IN LIEU OF PIPE BEDDING WHERE THE NEW SANITARY SEWER MAIN PERFORATES THE LANDFILL CAP.

6. THE PURPOSE OF THE PLUG IS TO PREVENT THE MIGRATION OF METHANE GAS OFF OF CITY PROPERTY ONTO CARROLL COLLEGE PROPERTY THROUGH THE PIPE BEDDING AROUND THE NEW SANITARY SEWER MAINLINE.

7. THE NET LENGTH OF THE FLOWABLE FILL PLUG THAT BLOCKS METHANE MIGRATION WITHIN THE TYPE-I PIPE BEDDING WILL BE AT LEAST TWICE THE HORIZONTAL LENGTH OF THE ACTUAL COVER PENETRATION AND BE CENTERED ON THE MIDPOINT.

8. A METHANE GAS MONITORING WELL WILL BE INSTALLED WEST OF THE PLUG IN THE PIPE TRENCH BEDDING APPROXIMATELY 10 FEET EAST OF THE CARROLL COLLEGE PROPERTY LINE ON GROUND OWNED BY THE CITY OF HELENA.

9. THE PURPOSE OF THE MONITORING WELL IS TO ENSURE THAT NO METHANE GAS HAS SEEPED AROUND THE PLUG AND IS MIGRATING OFF OF CITY PROPERTY ONTO CARROLL COLLEGE PROPERTY THROUGH THE PIPE BEDDING AROUND THE NEW SANITARY SEWER MAINLINE.

10. THE CITY'S ENGINEERING REPRESENTATIVE WILL INSTALL A PVC SCREW CAP AND SAMPLING PORT ON THE 1-INCH DIAMETER PVC METHANE MONITORING WELL TO INSURE IT MATCHES THE EXISTING MONITORING WELLS AND IS COMPATIBLE WITH THEIR MONITORING EQUIPMENT.

11. THE EXISTING LANDFILL "CAP" CONSISTS OF APPROXIMATELY 3 FEET OF CLEAN TOPSOIL. THIS CAP MATERIAL WILL BE SALVAGED, STOCKPILED SEPARATELY FROM LANDFILL WASTES, REPLACED AND COMPACTED ALONG THE TRENCHED AREA WHILE EXCAVATING THE INSTALLATION TRENCH THROUGH THE OLD LANDFILL.

12. EXCESS EXCAVATED WASTE MATERIAL FROM THE LANDFILL WILL BE HAULED TO AND DISPOSED OF AT AN OFFSITE LANDFILL. IF THE LOCAL PUBLIC LANDFILL WILL NOT ACCEPT THE MATERIAL, IT MIGHT BE DISPOSED UP AT A PRIVATE LANDFILL IN THE HELENA VALLEY OWNED BY CITY COUNTY SANITATION.

13. LANDFILL MITIGATION MEASURES WILL BE INCLUDED ON THE PROJECT'S AS-BUILT PLANS.

14. CONSTRUCTION PHOTOS WILL BE TAKEN IN THE LANDFILL AREAS PRIOR TO BACKFILL AND WILL BE PROVIDED AS CONSTRUCTION DOCUMENTATION.

15. THE CONTRACTOR'S TRAINED AND OSHA CERTIFIED SAFETY OFFICER WILL MONITOR METHANE GAS CONCENTRATIONS IN THE PIPE TRENCH DURING ALL CONSTRUCTION ACTIVITIES IN THE CENTENNIAL PARK AREA.

CITY OF HELENA PROJECT No. 03-24

MONTANA
SANNA M. YOST
7316 E
REGISTERED PROFESSIONAL ENGINEER

VERIFY SCALE!
THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.
MODIFY SCALE ACCORDINGLY!

REVISIONS			
NO.	DESCRIPTION	DATE	BY

MORRISON MAIERLE, INC.
An Employee-Owned Company
910 Helena Avenue Helena MT 59604
Phone: (406) 442-3050 Fax: (406) 442-7862
COPYRIGHT © MORRISON MAIERLE, INC., 2002

DRAWN BY: JQG
CHK'D. BY: SMY
APPR. BY: SMY
DATE: 6/2003
Q.A. REVIEW
BY:
DATE:

CARROLL COLLEGE CIVIL ENGINEERING LAB
SEWER MAIN EXTENSION PROJECT
HELENA MONTANA

SANAITARY SEWER PLAN AND PROFILE

PROJECT NO.
0245-016
SHEET NUMBER
2
DRAWING NUMBER
EXHIBIT 2